Chapter 3
KISSIMMEE REGION

PHYSICAL CONDITIONS - KISSIMMEE REGION

The Kissimmee Region is comprised of 3,013 square miles and extends from Orlando southward to Lake Okeechobee (**Figure 2**). The watershed, which is the largest source of surface water to the lake, is about 105 miles long and has a maximum width of 35 miles.

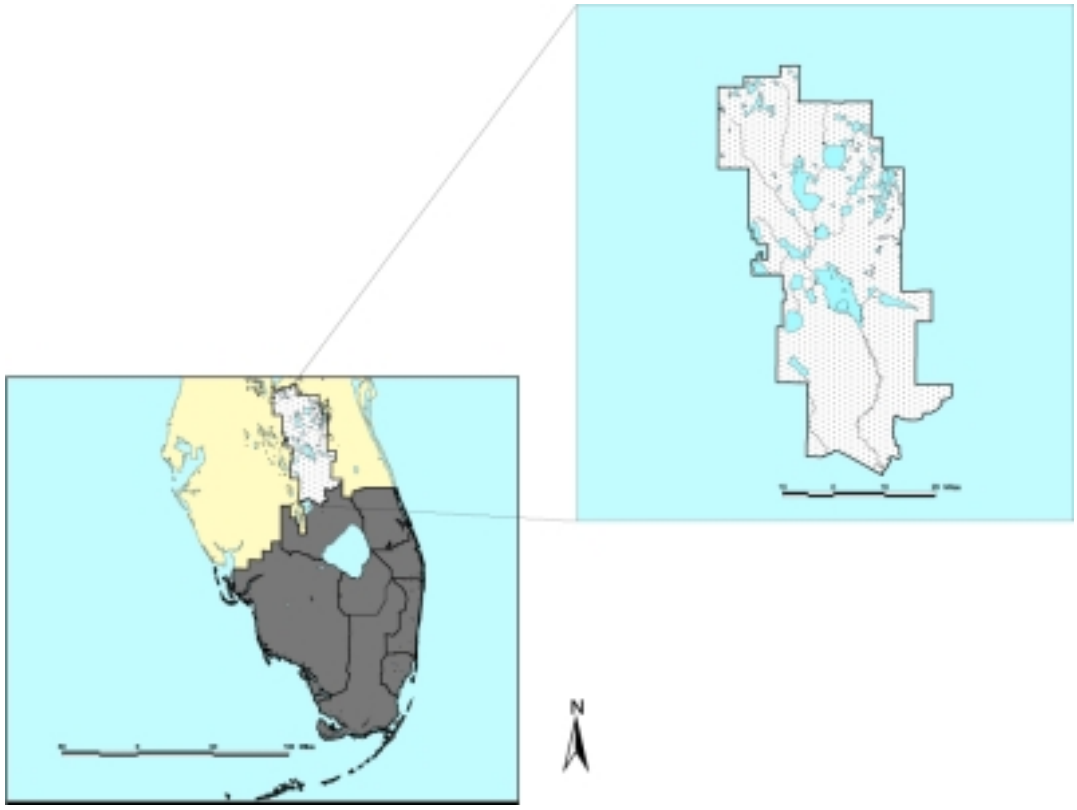

Figure 2. Kissimmee Region.

Project works in the basin for flood control and navigation were constructed by the United States Army Corps of Engineers (USACE) as part of the Central and Southern Florida Flood Control Project (C&SF Project). Upper Basin works consist of channels and structures that control water flows through 18 natural lakes into Lake Kissimmee. The Lower Basin includes the channelized Kissimmee River (C-38) as a 56-mile earthen canal extending from Lake Kissimmee to Lake Okeechobee.

The northern portion of the basin is comprised of many lakes, some of which have been interconnected by canals. This large subbasin, often termed the Upper Basin is bounded on the southern end by State Road (SR) 60, where the largest of the lakes, Lake Kissimmee, drains into C-38.

The Upper Basin is 1,633 square miles and includes Lake Kissimmee and the east and west Chain of Lakes area in Orange and Osceola counties. A 758 square mile Lower Basin includes the tributary watersheds of the Kissimmee River between the outlet in Lake Kissimmee and Lake Okeechobee. The 622 square mile Lake Istokpoga area provides tributary inflow to the Lower Basin.

EXISTING CONDITIONS - KISSIMMEE REGION WATER MANAGEMENT

The system of water control works now in place in the Kissimmee Watershed has been modified from the general C&SF Project plan outlined in the 1948 report to Congress and authorized for construction in 1954. The modifications are associated with the first phase of construction for the Kissimmee River Restoration (KRR) Project completed in February 2001. These modifications were authorized by Congress in the Water Resources Development Act of 1992. The original project was designed to provide flood damage prevention for 30 percent of the standard project flood (SPF). This equates to protection against a five-year flood event. Project modifications associated with the KRR Project maintain these same levels of flood protection. Water levels within the basin are controlled by a complex system of canals and control structures that are managed by the South Florida Water Management District (SFWMD or District) in accordance with regulations prescribed by the Secretary of the Army.

Channels connect the major lakes of the Kissimmee Upper Basin. Most of the channels were excavated by private interests in the 1900's and subsequently enlarged to varying degrees by the congressionally authorized C&SF Project plan. Additional operation and maintenance dredging and canal widening are associated with the KRR project. The first phase of this work was completed in August 2002. The remainder will be completed in 2003/2004.

Nine control structures regulate water levels and flows in the lake system. For more details on the C&SF flood control project refer to the USACE Kissimmee River, Florida - Final Feasibility Report and Environmental Impact Statement (1985). Operational criteria for both basins can be found in the Master Water Control Manual for the Kissimmee River-Lake Istokpoga Basin (1994). These operational criteria have been modified for the KRR project to include an interim regulation schedule for the S-65 structure. This interim schedule was put in place in June 2001 and will remain in effect until a new regulation schedule is put into place for the KRR project. Details regarding regulation schedules for S-65 can be found in the Headwaters Revitalization Plan (1996). From time to time, operations may temporarily deviate from the water control plan. These temporary deviations may be conducted for various purposes, such as control of nuisance aquatic vegetation, lake drawdowns or construction.

Prior to the project, lake outlets within the Upper Basin had been dredged for drainage and navigation, but were uncontrolled and over-drainage often occurred. Dredged outlets did not provide adequate flood control and the Upper Basin did not have enough outlet capacity (sometimes termed "get away" capacity) to remove flood waters within a reasonable time frame to avoid flood impacts.

To provide adequate outlet capacity from the Upper Basin, approximately 15 miles of canal were required immediately downstream of Lake Kissimmee. The length is a function of canal size, the size of the Lake Kissimmee outlet structure size (S-65) and the very flat terrain immediately downstream of the lake.

An earlier project, the Herbert Hoover Dike, around Lake Okeechobee modified the original lower end of the Kissimmee River with a borrow canal immediately upstream of Lake Okeechobee. This 8-mile section of canal, known as Government Cut, was modified and enlarged during construction of the C-38 and is inside the Lake Okeechobee containment levee. This section of canal diverted flow from a downstream portion of the Kissimmee River, creating an isolated remnant of the river known as Paradise Run. Paradise Run, immediately west of Government Cut, retains most of its original topography; however, diversion of natural flows has lowered water levels and former wetland areas have been converted to grazing and pasture land.

Between the outlet channel at the upper end of the Kissimmee River (C-38) and Government Cut at the lower end was a section of river and floodplain known as the central reach. This stretch was approximately 33 miles in length and also provided flood control. During the design phase of the C&SF project, some consideration was given to nonstructural approaches (e.g., levee the uplands from the floodplain); however, channelization was determined to be the most cost effective solution. Combined with Government Cut, the new canal (C-38) provided complete channelization of the entire 56-mile river-floodplain system from Lake Kissimmee to Lake Okeechobee.

The natural fall of the land from Lake Kissimmee to Lake Okeechobee is about 36 feet. Construction of the C-38 canal included construction of six water control structures (S-65, S-65A, S-65B, S-65C, S-65D, S-65E). These structure were distributed from north to south and formed a series of five independent water bodies called pools (Pools A, B, C, D and E). The northernmost structure, S-65, is located at the southernmost end of Lake Kissimmee. The southernmost structure is located just north of Lake Okeechobee. The pools are located between the structures and are referenced using the letter associated with the downstream structure.

The structures along the C-38 canal function as dams and were located to step the canal water level down in increments of approximately 6 feet. In doing so, the natural slope of the river was removed and flat pools (impoundments) resembling stair-steps were created. The water level in each pool was generally held constant with little fluctuation or slope. This management lowered water in the northern reach of each pool and maintained flooded marsh in the southern or lower section of each pool. The resulting water surface area was approximately 7,600 acres.

The C-38 was excavated to a depth of approximately 30 feet. The bottom width varies from 90 feet near Lake Kissimmee to 300 feet just above the S-65D structure. The canal's length, width and water level varied in each pool. The head, or difference in water level above and below each structure, varied from structure to structure with rate of discharge but is typically 6 feet.

This system has been modified by the first phase of construction on the KRR project. This construction was completed in February 2001 and was located in the vicinity of Pools B and C. The first phase of the project backfilled approximately 7 miles of C-38 canal from just north of the S-65B structure south to approximately the Istokpoga Canal. One and one quarter miles of new river channel were dredged to reconnect 14 miles of the historic river that had been bisected by the construction of the C-38 canal. The S-65B structure was demolished creating an interconnected river/floodplain system in the former Pool B and Pool C area.

During the construction of the C-38 canal, a temporary easement was used to obtain areas adjacent to the canal for deposition of dredged material. The material was hydraulically deposited in linear alignments covering some 8,000 acres. The result was spoil piles averaging 15 feet above pre-project topography. The material consisted of hydraulically sifted subsoil sands and clays with limited organic fraction and high percolation rates. The material became part of the property upon which it was deposited. A number of landowners subsequently used the material to fill low areas on their property. At two locations in Okeechobee County, the spoil was used to build flood free, fly-in residential subdivisions. Where material was left undisturbed, xeric vegetation emerged on the deposits.

The spoil material in the vicinity of backfilling activities associated with the KRR project will be used to backfill the C-38 canal. Lands within the 5-year floodplain were acquired in fee. This included acquisition of the spoil material.

The CS&F Project works improved navigation opportunities originally provided in the Congressional Act of 1902. Each water control structure along C-38 includes a 30-foot by 90-foot navigation lock, which can accommodate boats with drafts up to 5.5 feet. The canal provides continuous navigation; however, interpool navigation is limited to daylight hours of lock operations.

Prior to the completion of the first phase of the KRR project, there were approximately 68 miles of river oxbows, often referred to as remnant river channels, between Lake Kissimmee and Lake Okeechobee. These were created when the C-38 canal was dredged through the historic Kissimmee River/Floodplain system. These secondary channels features are of widely varying water depths that receive little to no inflows except from tributaries or through culverts associated with the S-65B, S-65C and S-65D tieback levees.

Since completion of the first phase of the KRR project, 14 miles of river channel have been restored and receive near continuous flows due to the interim operational schedule for the S-65 structure.

Approximately 50 tributaries provide inflow into the Lower Kissimmee Basin. Relatively constricted central channels characterize these tributaries with pasture lands usually extending along the channel. Most channels are covered with vegetation.

FUTURE WITHOUT PLAN CONDITION - WATER QUALITY - KISSIMMEE REGION

Several planned and ongoing environmental restoration projects are expected to be completed, which would beneficially affect water quality in the Kissimmee Watershed. Of particular importance is the Kissimmee River Restoration Project (including the Headwaters Revitalization and Modified Level II Backfilling projects). The Kissimmee River Restoration Project is expected to result in the restoration of approximately 7,200 acres of former wetlands in the vicinity of the Kissimmee Chain of Lakes (USACE, 1996) and at least 28,000 acres of former (drained) wetlands south of Lake Kissimmee (USACE, 1991).

FUTURE WITHOUT PLAN CONDITION - PHYSICAL FACILITIES AND OPERATIONS - KISSIMMEE RIVER RESTORATION

In the future without plan condition, the Kissimmee River Restoration Project will be in place and functioning. The restoration project, authorized by the Water Resources Development Act of 1992, will create a more natural physical environment in the Kissimmee Lower Basin. The major components of the project include the following:

- Reestablishment of inflows from Lake Kissimmee that will be similar to historical discharge characteristics (headwaters component)
- Acquisition of approximately 110,000 acres of land in the lower Kissimmee Chain of Lakes and river valley
- Continuous backfilling of 22 miles of canal
- Removal of two water control structures
- Recarving of 9 miles of new river channel

The Kissimmee Watershed contributes about 30 percent of the water input to Lake Okeechobee. The supply of water to Lake Okeechobee is anticipated to be reduced by about 1.60 percent as a result of the implementation of this project.

As a component to the Kissimmee River Restoration Project, the modification of the Upper Chain of Lakes regulation schedules and associated canal and water control structure modifications, will restore the ability to simulate the historic seasonal flow from Lake Kissimmee to the Lower Basin, and provide higher fluctuations of water levels in the lakes. The project will result in the expansion of the lakes' littoral zones by up to 7,200 acres, and improved habitat to fish and wildlife on lakes Kissimmee, Hatchineha, Cypress,

Tiger and Jackson. The project will also increase spatial and temporal dynamics produced through long-term fluctuations of seasonal water levels.

The Kissimmee River Restoration Project will meet two hydrologic conditions (criteria) that must be reestablished to restore the Lower Basin ecosystem. These conditions are the reestablishment of continuous flow with duration and variability characteristics comparable to prechannelization records and the reestablishment of stage hydrographs that result in floodplain inundation frequencies comparable to prechannelization hydroperiods, including seasonal and long-term variability characteristics.

WATER QUALITY PROBLEMS AND OPPORTUNITIES - KISSIMMEE REGION

By 2050, water quality conditions in the Kissimmee Watershed south of urbanized Orange County, are expected to be improved as compared to existing conditions, due to ongoing and planned ecological restoration programs in the drainage basin. In its 1998 303(d) list, the FDEP identified approximately 25 water bodies or segments of water bodies within the Kissimmee Watershed where water quality was not adequate to sustain designated uses. Several of the 303(d) listed water bodies are actually reaches of the Kissimmee River. Most of the watershed is classified as Class III ("fishable–swimmable") waters; several water bodies within the watershed are designated Outstanding Florida Waters by the state of Florida. Pollutants and/or water quality criteria identified contributing to impairment of designated use include: low levels of dissolved oxygen (DO), excessive nutrients, coliform bactieria, high biochemical oxygen demand (BOD), several trace metals including mercury (based on fish-consumption advisories), turbidity and un-ionized ammonia.

Kissimmee River Restoration projects are expected to reduce net pollution loading to the Kissimmee River and in downstream Lake Okeechobee through the restoration of remnant wetlands presently used as agricultural lands currently contributing pollutants to wetlands. Restored wetlands will also have a pollutant assimilation function, resulting in improved water quality in downstream water bodies (tributaries and oxbows). Additional ongoing land acquisition activities by the SFWMD will supplement ongoing environmental restoration projects (SFWMD, 1997a).

The extent of urbanization in the vicinity of the cities of Orlando and Kissimmee, north of the Kissimmee Chain of Lakes is expected to increase. While new developments must comply with water quality treatment requirements for storm water runoff, the net load of pollutants, particularly those typically associated with urban storm water runoff contributed to the watershed north of the Kissimmee Chain of Lakes is expected to increase. Most of this increased pollution load is expected be retained in the Kissimmee Chain of Lakes and not enter the Kissimmee River – Lake Okeechobee system. Urbanization and attendant pollution loads in the region are not expected to increase significantly south of Lake Kissimmee.

LAND USE - KISSIMMEE REGION

Orlando, at the headwaters of the Kissimmee Watershed, is the primary economic and transportation center in the area. Once the center of the state's orange production, the local economy of Orlando and the surrounding area now focuses on tourism. Kissimmee, located in Osceola County, is located 8 miles east of Disney World and 17 miles south of Orlando, and is influenced largely by tourism activities in the Orlando area. The other major incorporated area of Osceola County, the city of St. Cloud, is primarily a retirement community.

Land uses in the Upper Basin around the perimeters of Lakes Kissimmee, Hatchineha, Cypress, Rosalie, Tiger and Jackson are primarily pasture, some agriculture and a large amount of wetlands. Marinas, fish camps and various public facilities, such as boat launching sites and picnic areas, are located around the lakes. Development is more intense upstream of Cypress Lake, particularly in the Lake Tohopekaliga – East Lake Tohopekaliga (Toho) chain. Lake Kissimmee State Park is on the extreme northwestern periphery of Lake Kissimmee and the Three Lakes Wildlife Management Area and Prairie Lakes Preserve border the southeastern half of Lake Kissimmee. The 45,000-acre Kissimmee Prairie State Reserve is directly east of Avon Park in Pool B. Small residential and commercial areas are also scattered around most of the lakes.

Agriculture continues to play an important role in the region. In the Lower Basin, most of the area between Lake Kissimmee and Lake Okeechobee is in fewer than fifty large, private land holdings and several hundred subdivided property holdings. Agriculture remains the primary land use activity within the Lower Basin, being dominated by extensive beef cattle production and dairy activities.

The Avon Park Air Force Bombing Range is located within the Highlands County portion of the Lower Basin. This 107,000-acre federal facility is used both as a training facility for Armed Forces personnel and as a management area for wetlands adjacent to the Kissimmee River.

Lower Basin lands have undergone substantial change over the last twenty years. Most notable is the conversion of unimproved pasture land to improved pasture at an accelerated pace during the period 1958 to 1972.

In the Upper Basin, most of the development susceptible to flood damage is urban, where damage is primarily a function of the depths of flooding inside structures or the stage of flooding. Single family residential land use is the primary type of development affected by flooding in the Upper Basin. Major affected areas are located around the towns of Kissimmee and St. Cloud, which cover only six percent of the damage susceptible flood-prone area but account for almost half of the basin's standard project flood damage. Other affected areas include Lake Hart, Lake Mary Jane, Pells Cove, Hidden Lake, Lake Hatchineha, Lake Alligator, Lake Rosalie and the area west of the southern part of Lake Kissimmee. Existing average annual equivalent flood damages in the Upper Basin are estimated to be $1,226,100 (8 ¾ percent rate).

In the Lower Basin, mobile homes located around Pool E are the primary areas that would be affected by flooding. Although this land use would account for most of the damages from a standard project flood and 100-year event, it is not susceptible to damage during smaller floods. Other damages occur due to the duration of flooding on pasture land. Although agricultural use is the primary land use in the Lower Basin, flood damages are relatively minor for this activity due to the short duration of flooding, a result of the existing project works. Existing average annual equivalent damages in the Lower Basin are estimated to be $97,700 (8 ¾ percent rate).

Agriculture

Osceola, Polk, Highlands and Okeechobee counties were included in this region. More than two million acres in these counties are farmed, with more than half of this area devoted to pasture land (UFBEBR, 1995). Much of this acreage is likely categorized as unique farmland based upon its location, growing season and high value crops, including citrus. Almost a quarter of a million acres in the Kissimmee Watershed are irrigated (UFBEBR, 1995), requiring a dependable water supply. Large farms characterize this region, with relatively low productivity per acre. These four counties are among the top five counties in Florida for cattle production, both beef and dairy (FASS, 1996a). More than 200,000 acres are used for citrus production. Approximately 11,000 people are employed in agricultural production and services representing a payroll of approximately $21 million (UFBEBR, 1995). The market value of all agricultural products in this region totals approximately $575 million (UFBEBR, 1995).